

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS
OFFICE OF SECRETARY

In the Matter of

THE DEVELOPMENT OF OPERATIONAL,
TECHNICAL, AND SPECTRUM
REQUIREMENTS FOR MEETING FEDERAL,
STATE, AND LOCAL PUBLIC SAFETY
AGENCY COMMUNICATIONS REQUIREMENTS
THROUGH THE YEAR 2010

WT Dkt. No. 96-86

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COMMENTS OF NEBRASKA PUBLIC POWER DISTRICT

The Nebraska Public Power District, an instrumentality of the State of Nebraska, applauds the dedication of the joint FCC-NTIA Public Safety Wireless Advisory Committee in producing its Final Report.

THE COMMISSION SHOULD RECOGNIZE THAT INTER-SERVICE SHARING ON JOINT MOBILE RADIO NETWORKS WOULD YIELD GREATER SPECTRAL EFFICIENCY.

Inter-service sharing of frequency assignments on joint systems would produce more efficient spectrum through more intensive channel usage. In addition, joint inter-governmental mobile radio systems would permit earlier budgeting for new, more spectrally efficient equipment, based on governmental budgetary savings from joint systems.

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As proponent of statewide, integrated fiber and mobile radio systems, we have previously commented on the draft report's recognition of the operational advantages and spectral efficiencies of joint-user, governmental networks. In particular we find resonance in the following scattered conclusions and recommendations, viz.:

- Improved interoperability is required.
- More flexible licensing policies are desirable.
- More sharing and joint use should be encourage.
- A flexible regulatory environment which encourages the development of shared system infrastructure supporting Public Safety communications.
- Public service providers, such as ... utilities ... play important rôles in supporting first responders once an incident does occur. In all their operations, they have many of the same needs as Public Safety agencies.
- Public safety systems need quick expendability to accommodate peak use.
- Most Public Safety mobile communications systems need a reliable backbone to carry signals to and from the base station sites to the control points.
- Trunking will become increasingly prevalent as the technology for trunking control becomes deployed and copies in what are currently known as conventional systems.
- Joint-use and Shared Systems or consolidated systems covering the same geographic area, either conventional or trunked, readily provide interoperability to those agencies sharing the system. Consolidated systems allow multiple agencies to operate in the same frequency band using compatible equipment on the same infrastructure. These systems improve spectrum efficiency because they allow multiple agencies to interoperate without the need for additional spectrum.

- The Transition Subcommittee urged greater effort toward the development of shared federal, state and local systems that facilitate closer cooperation between all levels of government. The expansion of large wide area land mobile communications systems would bring enhanced capability to all levels of government. The subcommittee noted that spectrum efficiency can be increased through spectrum sharing by multiple Public Safety agencies. . . .

In addressing the issue of block licensing to states, the subcommittee noted that structures should be embraced that bring about state and local planning, owners [sic] have an incentive to approach spectrum efficiency and enhanced services. Shared state or wide area systems are reflective of this goal.

NPPD submits that all the crucial points in favor of state-wide, shared systems -- as advocated in NPPD's statement of February 20, 1996, submitted in the FCC's en banc hearing on spectrum policy and to the PSWAC, a copy of which is enclosed -- are recognized in the final report.

Thus, PSWAC Final Report recognizes approvingly, but in isolation, most of the constituent factors that validate inter-governmental mobile radio systems, employing inter-service frequency sharing. The Final Report of the Steering Committee recognizes, inter alia:

- "Less peaky" channel occupancy because of different traffic characteristics of diverse users;
- Budgetary relief through shared ground environments;
- Inter-operability through shared radio environments.

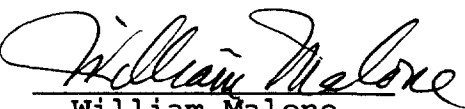
Op. cit. at pages 3-5, paragraphs 2.2.5, 3.1, 4.1.8, 4.1.17, 4.2.29, 4.3.21, 4.5.6, and 4.5.8.

What is missing from the Final Report is a synthesis of these elements into forward-looking, partial relief for spectrum scarcity. Additional flexibility for sharing needs to be built into Part 90 of the Commission's rules.

Conclusion

Accordingly, the Commission should use the PSWAC's Final Report as the basis for bringing together in one paragraph an endorsement of statewide, joint-user systems under more flexible FCC joint use and liberalized inter-category licensee-eligibility standards, recognizing that such systems would be more spectrum-efficient, would accommodate peak loads through dynamic capacity allocation, would inherently solve the inter-operability problem, and would cost less per-user to build and to operate.

Respectfully submitted,

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Attachment

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the matter of the
en banc hearing on

SPECTRUM POLICY

DA 96-190

WRITTEN STATEMENT OF NEBRASKA PUBLIC POWER DISTRICT

This written statement is offered on behalf of the Nebraska Public Power District. NPPD is a public corporation and a political subdivision of the State of Nebraska. It provides wholesale and retail electric services, and its chartered territory encompasses approximately ninety-nine percent (99%) of the geographic area of the state.

Summary

Revision of the Commission's rules for terrestrial radio services would allow employment of new technology to increase the efficiency of spectral use and of the delivery of public services. The Commission's present restrictions on inter-category sharing were based on the limitations of now-obsolete technology.

Liberalized inter-category sharing among governmental entities is necessary to facilitate joint mobile radio networks employing new trunking technology. Joint governmental communications systems foster more efficient use of the spectrum through

- broader financial support for speedier conversion to newer, spectral-efficient technologies; and
- reduced spectral bandwidth requirements through
 - statistical aggregation of peak-load demand, and
 - dynamic channel load-shedding through software-driven "recapture" of channels from lower priority uses.

In addition, joint communications networks foster more effective joint relief and restoral operations during emergencies by providing inter-operability among participating entities.

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Argument

I. LIBERALIZED, INTER-CATEGORY SHARING WILL PERMIT MORE EFFICIENT AND EFFECTIVE USE OF THE SPECTRUM SOONER.

Whatever the Commission's forthcoming decision on consolidation of land mobile services in Docket No. 92-235, the Commission should liberalize its rules governing collective use to permit multiple governmental users and allied non-governmental public service entities to operate joint radio networks. Liberalized inter-category-sharing and joint-use rules are necessary to reach the full potential for spectral efficiency and effective provision of public services.

Those parties opposing pooling¹ or liberalized sharing have failed to consider the total picture. The Commission should not allow itself to be similarly "spooked" by specters of capture by commercial providers of the spectrum allocated to public safety users.² In fact, modern technology allows (1) a multiplicity of governmental entities to simultaneously enjoy the operational

1/ See, e.g., APCO's Position Paper on Radio Service Consolidation, filed November 20, 1995, in Docket No. 92-235 contending that consolidation will work only in virgin spectrum. APCO's argument overlooks the fact that refarming is intended to substantially increase the capacity of the bands below 470 mcs. See also Comments of ASSHTO at 3.

2/ See, e.g. Comments of American Petroleum Institute in Docket No. 92-235 at 12 favoring sharing of "excess" capacity but opposing resale; Comments of AAR at 36-37; Comments of Alarm Industry Communications Committee at 8; Comments of Weyerhaeuser at 5-6; Comments of PacifiCorp at 3; Comments of Boeing at 6-9.

benefits of "dedicated" virtual systems and the economies of an aggregate transmission system and, with a joint system, (2) inter-operability among multiple entities involved in a common effort to aid the public. These benefits are described in "Sharing Trunked Public Safety Radio Systems Among Federal, State, and Local Organizations," the Appendix to NTIA's report on Land Mobile Spectrum Planning Options, Special Publication 95-34 (October 1995).

Sharing of even emergency response channels is warranted by the dynamic "recapture" of channel capacity from otherwise-ineligible users in accord with public safety priorities. Through software-driven channel assignment, the larger number of channels available to users of a joint system can be dynamically reallocated among users of the common system according to prioritized needs.

A. Joint systems promote spectral efficiency.

The high ratio of peak-to-average channels required by the public safety users leads to unnecessarily high channel requirements. NTIA's recent report on Land Mobile Spectrum Planning Options, supra, recognizes this characteristic of these services at page 2-11:

A critical element of public safety communications systems is the need to accommodate peaks in service demand that occur during multiple emergencies. There must be sufficient capacity to handle not only normal day-to-day communications needs, but also large scale emergencies such as civil disturbances, storms, major

fires, earthquakes, and other natural and man-made disasters.

Joint systems produce more efficient use of the spectrum. To the extent that peak-load demands of the different public service entities vary, equivalent channel-blocking probabilities can be achieved with fewer collective channels than the aggregate number of channels required by individual systems to achieve the same $P(0)$. For example, the channels needed to accommodate peak-load requirements by the Highway Department in the day can be reassigned to accommodate peak-load requirements by the Police Department at night.

Individual, non-shared systems fail to take advantage of the statistical nature of blocking. In principle, the larger the number of potentially available channels per user, the lesser the probability of a call's being blocked. Two simplified numerical examples will make the potential benefit of this principle clearer.

Example A. Assume two users each with an average channel requirement of 5 and a peak channel requirement of 10. To achieve a probability of blocking of less than five percent ($P[05]$), each user would require ten channels, or twenty in all. If the two users combine their systems and if their respective peaks are non-coincident, then the aggregate channel requirement would drop to fifteen, for a spectrum saving of 25 percent.

Example B. The channel economies become more dramatic as the number of users with non-coincident peaks increases. Assume six users, each with an average channel requirement of 5 and a peak channel requirement of 10. To achieve a probability of blocking of less than five percent ($P[05]$), each user would require ten channels, or sixty in all. If the

six users combine their systems and if their respective peaks are non-coincident, then the aggregate channel requirement would drop to thirty-five, for a spectrum saving of forty percent.

The benefits of joint use are even more spectacular if the peak-to-average ratios are higher, say 4:1, instead of 2:1. In example A, the sum of the disaggregated channel requirements would be 40, while the channel requirements for a combined system would be 25, or a spectrum saving of nearly forty percent. In example B, the sum of the disaggregated channel requirements would be 120, while the channel requirements for a combined system would be 45, or a spectrum saving of over sixty percent.

"Recapture" of lower priority channels would improve the spectrum savings even more. Assuming that a lower level of service for five of the six users in Example B was acceptable during times of emergency, so that at peak one user had 20 channels and each of the other five users had three channels, the number of channels required by a combined system would be $3 \times 5 + 20 = 35$, and the spectrum saving (compared to 120 channels) would be over seventy percent.

B. Joint systems enhance delivery of public services.

To the spectrum-saving benefits of a combined system should be added the greater effectiveness and efficiency in the delivery of services to the public. Joint systems permit flexible inter-agency inter-operability when two or more entities are engaged in a common effort in the public interest. Through software-

controlled dynamic channel assignment, all mobile units have potential access to all channels of a joint system without sacrificing security. Such inter-operability enables operational coordination among entities for more efficient and effective delivery of service.

C. Joint systems reduce communications costs.

Joint systems reduce the impact of advanced communications on governmental budgets. Because fewer channels are required in the aggregate and because separate equipment is not required for inter-operability, advanced communications systems can be installed for less total cost. Thus, the spectral efficiency which the Commission seeks can be achieved sooner, because (i) the total cost is less than the aggregate cost for separate systems and (ii) common costs can be spread among a larger number of users.

II. LIBERALIZED SHARING WILL ACCELERATE SPECTRUM EFFICIENCY.

By adopting liberalized sharing rules the Commission can advance the installation of new, more spectrum-efficient radio systems by governmental users.

By taking into account the impact on governmental budgets, the more using entities that can join in a joint system, the faster the Commission's goals of spectral efficiency can be achieved through installation of advanced communications equipment. The NTIA report observes that the public safety community

has "been slow to adopt new technologies that could provide much more efficient use of the spectrum." Op. cit. at A-1. The reasons center as much on cost as any other factor. By adopting appropriate sharing rules, the interests of APCO and the other objecting parties will be advanced. The carrot would be far more effective than the stick.

**III. OPTIMAL CONFIGURATION OF JOINT GOVERNMENTAL NETWORKS
REQUIRES NON-RESTRICTIVE SHARING OF SUCH NETWORKS BY
ALL PARTICIPATING ENTITIES.**

Optimal configuration and financial support of joint governmental networks depends on the Commission's adopting flexible rules for inter-category sharing and for shared use of the joint network by non-governmental entities.

To maximize the statistical benefits of "trunking," described under Point I(A) ante, all users should have potential access to all radio channels at any given time, irrespective of whether the user of a channel at any given instant is eligible for licensing in the service to which that particular channel is allocated or not. Any categorical restrictions would require additional channels and reduce the system load factor -- foreclosing achievement of maximal spectral efficiency.

Lower-priority ineligibles should be permitted access to all radio channels in the joint network on a pre-emptible basis.³

3/ UTC supports allowing private system licensees to lease reserve capacity on "a priority-interruptible basis". UTC Comments in Docket No. 92-235 at 19.

Because their use would be subject to pre-emption by higher priority uses,⁴ such conditional use would not evade the purpose of the Commission's categorization rules. The number of higher category channels would still be sized by present and future channel requirements of the higher category users. There would be no "excess" capacity in the reuse of unused capacity. The reserve capacity created thereby would be more fully utilized on an instantaneous basis during emergency and non-emergency conditions, thereby reducing the aggregate demand on the spectrum.

The Commission should avoid imposing financial restrictions on such joint governmental networks, i.e., the Commission should not inquire into the formulae for apportionment of either the joint capital costs or the joint operational costs of the joint system, nor should it attempt to limit the joint systems' charges to non-governmental users subject to pre-emption.

The Commission should not impose restrictions on the entity to whom the network is to be licensed. Different organizational

4/ LMCC's non-unanimous opposition to "resale of excess capacity", LMCC Comments in Docket No. 92-235 at 18, and UTC's proposal to restrict both the "lease of reserve capacity" and interservice sharing "from a higher-ranked service to a lower ranked service, but not vice versa", UTC Comments at 10, 19, 29, overlook the recapture mechanism as a mechanism for more efficient spectrum utilization by allowing resale or sharing both "up" and "down" the priority scale. LMCC, however, would not "preclude ... non-profit cooperative use systems", LMCC Comments at 18 n.15, a category broad enough to encompass the governmental joint use systems supported by NPPD. See also Sprint-United and Centel Comments in Docket No. 92-235 at 5 (CMRS status).

forms will be more salutary in various cases, responding to different factors such as bonding limitations, procurement protocols, and legal limitations on inter-jurisdictional contracts. The Commission can fairly satisfy the concerns of those comments hostile to achieving spectrum economy through sharing by requiring the applicant to demonstrate the comparability of high-category spectrum requested to the system's high-category use projected on a long-term basis.

Conclusion

The Commission should reject the opposition to greater spectral efficiency through inter-category sharing and joint use offered by APCO and others and instead should revise its allocation rules to encourage joint governmental networks.

Respectfully submitted,

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